

Patent Claims **What IS CLAIMED IS:**

1. A method for eliminating eruptions, impurities and/or damage in the crystal lattice by selectively etching at least one silicon element, in particular of surface-plated, sawn-out parts of a silicon wafer, characterized in that at least areas of the silicon element are brought into contact with a gaseous etching medium that etches silicon selectively in a chemical reaction, with gaseous reaction products being produced during etching.
2. The method according to Claim 1, characterized in that the etching medium contains an interhalogen compound that is in a gaseous state or was converted to the gaseous phase or a fluorine-noble gas compound, in particular chlorine trifluoride, bromine trifluoride, iodine pentafluoride, xenon difluoride, or a mixture of these compounds.
3. The method according to Claim 1, characterized in that the reaction product is silicon tetrafluoride.
4. The method according to Claim 1, characterized in that etching is carried out at a pressure of 0.1 mbar to 1,000 mbar.
5. The method according to Claim 1, characterized in that the gaseous etching medium is diluted with an inert gas, in particular helium, to control the etching medium aggressiveness and/or the etching rate.
6. The method according to Claim 1, characterized in that the etching medium or part of the etching medium is converted from the solid phase to the gaseous phase by thermal sublimation, using a solid source; or is converted from the liquid phase to the gaseous phase by introducing an inert gas, using a bubbler; or is converted from the liquid or solid phase to the

gaseous phase based on its vapor pressure at a defined temperature.

7. The method according to Claim 1, characterized in that the silicon element or a multiplicity of silicon elements are sawn from a silicon wafer prior to etching.

8. The method according to Claim 7, characterized in that the silicon wafer is first attached to a carrier, in particular a sawing sheet clamped into a frame.

9. The method according to Claim 7 or 8, characterized in that the silicon elements are initially left on the carrier, in particular the sawing sheet, after they have been sawn out and treated while still attached to the carrier.

10. The method according to Claim 9, characterized in that the sawing sheet is expanded after sawing out the silicon elements and before selective etching to increase the distance between the silicon elements, with the frame being used as an expansion frame for the sawing sheet.

11. The method according to Claim 8, characterized in that the sawn-out silicon elements are dried before selective etching, in particular by heating them with a radiation heater in a vacuum at a pressure of less than  $0.1 \mu\text{bar}$ .

12. The method according to at least one of the preceding claims, characterized in that the etching rate while etching the silicon element is adjusted by selecting the etching medium, and/or the etching medium composition, and/or the etching temperature.

13. The method according to at least one of the preceding claims, characterized in that the gaseous reaction products produced during etching are removed during and/or after etching the silicon elements.

14. The method according to at least one of the preceding claims, characterized in that, after etching in a reaction chamber, leftover etching medium or leftover reaction products are removed from the etched silicon elements in a vacuum in a load lock, in particular at a pressure of less than 0.1  $\mu$ bar and at an elevated temperature.

15. The use of the method according to at least one of the preceding claims to etch the edges of power diodes.

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